

Fisheries Division

All thirteen fisheries employees listed in 1937 worked in hatcheries. In fact, for the first two years the entire fisheries program of the new Conservation Commission consisted of hatching and releasing fish, plus some fish rescue work. It was the program inherited from the old Fish and Game Department.

Director Bode had no training in fisheries work and, at first, other matters occupied his attention. Dr. George B. Herndon, chief of Fisheries, was a dentist by profession who had been politically appointed to his post under Wilbur Buford. He had no background in

fisheries and, although a good administrator, offered little real leadership in development of fisheries programs beyond what had been done in the past. Since the new Commission felt upland wildlife problems more pressing and trained fisheries personnel were difficult to locate, it wasn't until 1939 that they got around to hiring a fisheries biologist.

They were moved to do this by complaints that fishing in Lake of the Ozarks had deteriorated from the glory days following impoundment in 1931. Albert E. Weyer, with a master's degree from Oberlin College, was



A photo of Bennett Spring during the 1930s shows the old dam, trout hatchery and site of the new bridge below the old ford, where a car valiantly crosses the river.

sent to Lake of the Ozarks in July, 1939, to determine why fishing wasn't better and what could be done about it. Fisheries research had come to Missouri.

Unfortunately, Weyer was called into government service during World War II and his work at Lake of the Ozarks was cut off. He recognized the importance of habitat to fishes and managed to introduce some aquatic plants into the lake, the lack of which he believed to be an inhibiting factor.

A few months after Weyer was hired, a chief fisheries biologist, Dr. William C. Frohne, educated at the University of Tübingen, Germany, Cornell and the University of Michigan, was employed. He began the first systematic survey of Missouri's streams in 1941, to identify the more important factors which influenced the population of fishes in each stream, to the end that a practical plan of stream management to improve conditions for fishes and fishing might be developed. According to John Funk, who later headed fisheries research, the survey was modeled

after similar surveys which had been done in New York and elsewhere and was the generally accepted form of fisheries investigations of the time. Frohne's survey work was also interrupted by the War, and a report was rather hastily compiled that was of little value for future use.

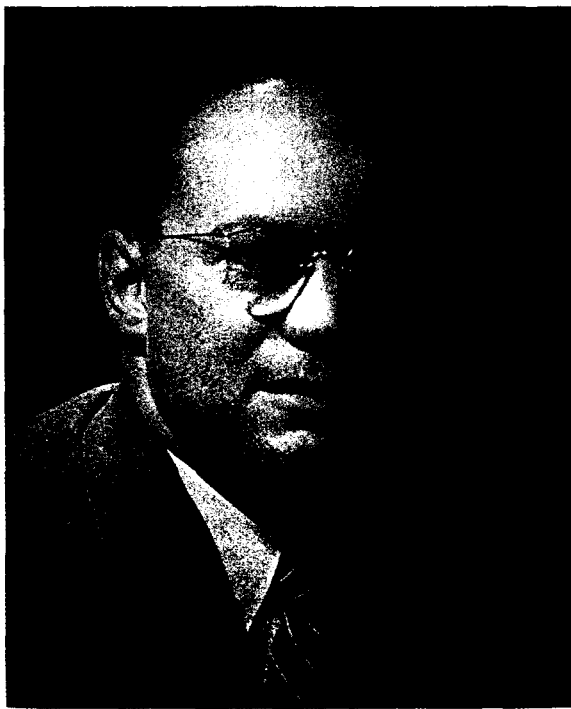
Some fisheries work had been done by wildlife biologists. A. Hugh Denney had made collections of fish in the area where he was assigned, and earlier as an employee of the U. S. Forest Service. In 1940 and 1941, a graduate student, George V. Harry, made collections from representative waters sufficient for a comprehensive study of fish distribution, but his work was interrupted by World War II and never resumed.

Paul G. Barnickol, who was to become an assistant director, was hired in 1939 and assigned to pollution investigations. He dealt with problems much the same as **today's**—acid pollution from strip mines, sewage effluents, packing plant wastes, summer kill. As there were no pollution laws on the books, a polluter could only be prosecuted for killing fish. Reports of fish kills usually were received too late for specific charges to *be* filed. In the rare instance when an offender was brought into court the jury, reflecting the apathy of the times, was likely to find him not guilty.

Fisheries research, along with many other Department programs, suffered from personnel and equipment shortages during World War II. It got a boost in 1944, when an aquatic biologist, Dr. Robert S. Campbell, was added to the Cooperative Wildlife Research Unit of the University of Missouri. For the first time, courses in fisheries and aquatic biology were offered.

Also in 1944, Missouri and Illinois undertook a cooperative survey of fish and fisheries of the Mississippi River which documented conditions at the time and resulted in recommendations for management, especially of commercial fishing. In 1945, a survey of conditions on the Missouri River was done by the Department and University of Missouri.

One of Fisheries' early major **programs**—farm ponds—actually had its inception in the Game Section. Biologist Harold V. **Terrill** is generally credited with beginning the pond



Paul G. Barnickol, shown here in 1941, was hired by the Department in 1939 to investigate water pollution problems. He would rise to become chief of Fisheries and assistant director.

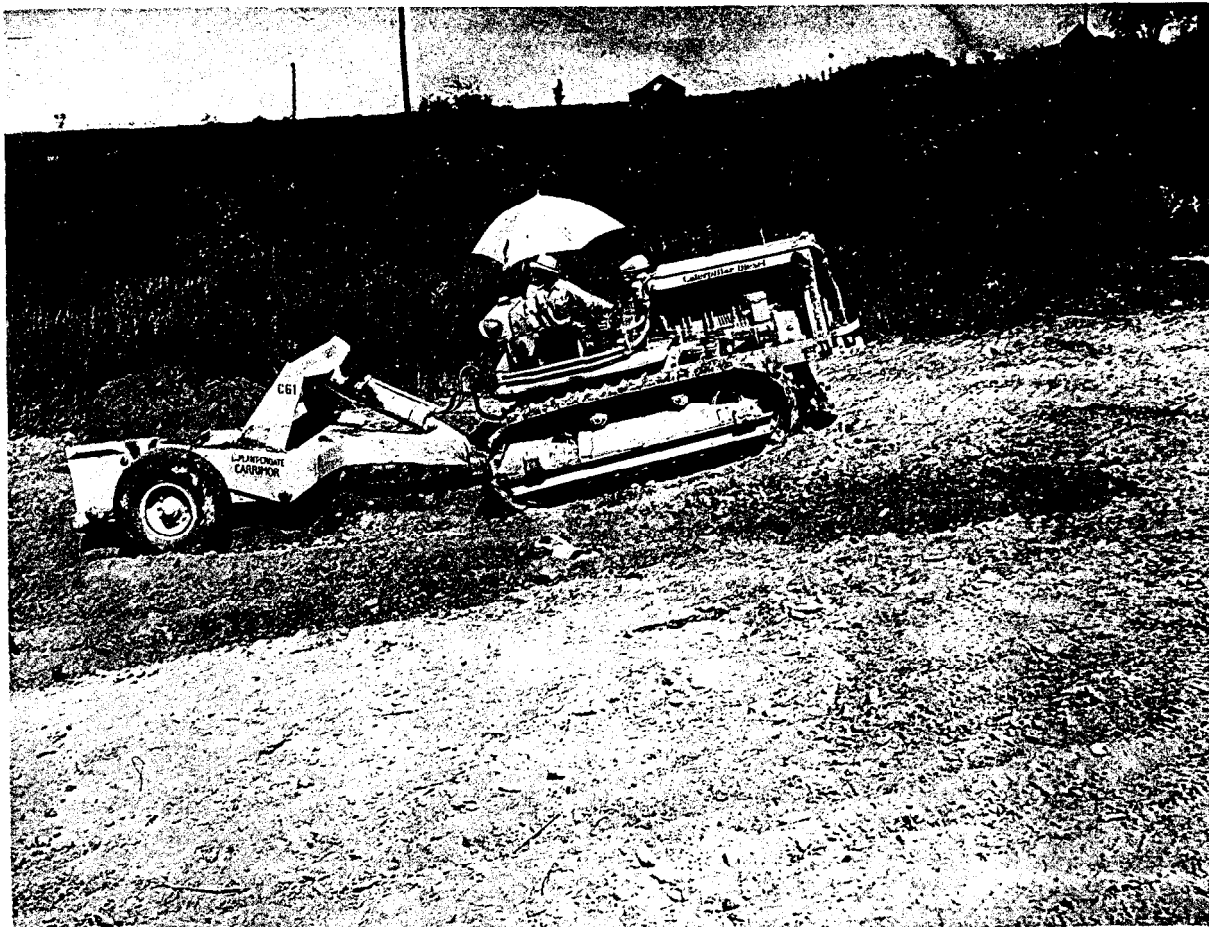
program. Terrill found there was only one water area with aquatic plants, capable of supporting wildlife through the year, in each 13,755 acres of the state. Access to water (remember, we were just coming out of a drought) was a limiting factor for upland game. The pond program's aim was to get water on the uplands for wildlife. A report stated, Early in 1939, the Commission recognized the potential importance of farm ponds as a partial solution to the problem, and promptly undertook to develop a practical plan to bring about the construction of more farm ponds of a type which would be permanent, furnishing water in critical periods of drought and which would serve the needs of wildlife.

Early Department staffers gathered March 26, 1943, at Stephens Hall on the University of Missouri campus for this group photo taken by Paul Dalke. Recognizable among the crowd are Bettye Hornbuckle, Sydney Stephens, Harold Clover, I. T. Bode, Gwen Turnbull, Paul Tulenko, Charles Schwartz, George B. Herndon, Herbert J. Fisher, Paul Barnickol, Glenn Pittenger and Glen E. Stoner.



Willis Hanson, left, and Charles Purkett, right, were two early Fisheries Research biologists.





A work crew constructs a farm pond on the Frank Oliver farm near Linn in 1941. Most pond construction was done by farmers who borrowed equipment from the Department.

The Department began advocating construction of farm ponds with the added inducement of having water available for livestock, recreation and even domestic water supply. The University published a bulletin on pond location and construction, also adopting farm ponds as an Extension program.

The Department bought a few bucket scrapers for loan to cooperating farmers, eventually adding more advanced rotary scrapers to its arsenal. Because scrapers were in short supply, field men competed with each other for their use, and gradually farm ponds began to dot the landscape. In 1941, there were 682 ponds completed and 188 begun, with Plans for 612 more ponds scheduled for 1942. When federal subsidies for pond construction

became available the program really got a boost. The Department made available pipe for bringing water to livestock, and even helped with fencing on some demonstration ponds.

As an added inducement, the Commission authorized free stocking of new ponds with fish from its hatcheries, if the landowner would agree to permit some public fishing. In 1945, fisheries biologist **Aden C. Bauman** was assigned to study farm ponds to make them more suitable habitat for fish. He studied different combinations of fish species, stocking rates and the effects of fertilization. Bauman was killed in an airplane crash while surveying farm ponds on August 31, 1947. Another biologist assigned to pond research, Richard C. Marzolf, also died accidentally in

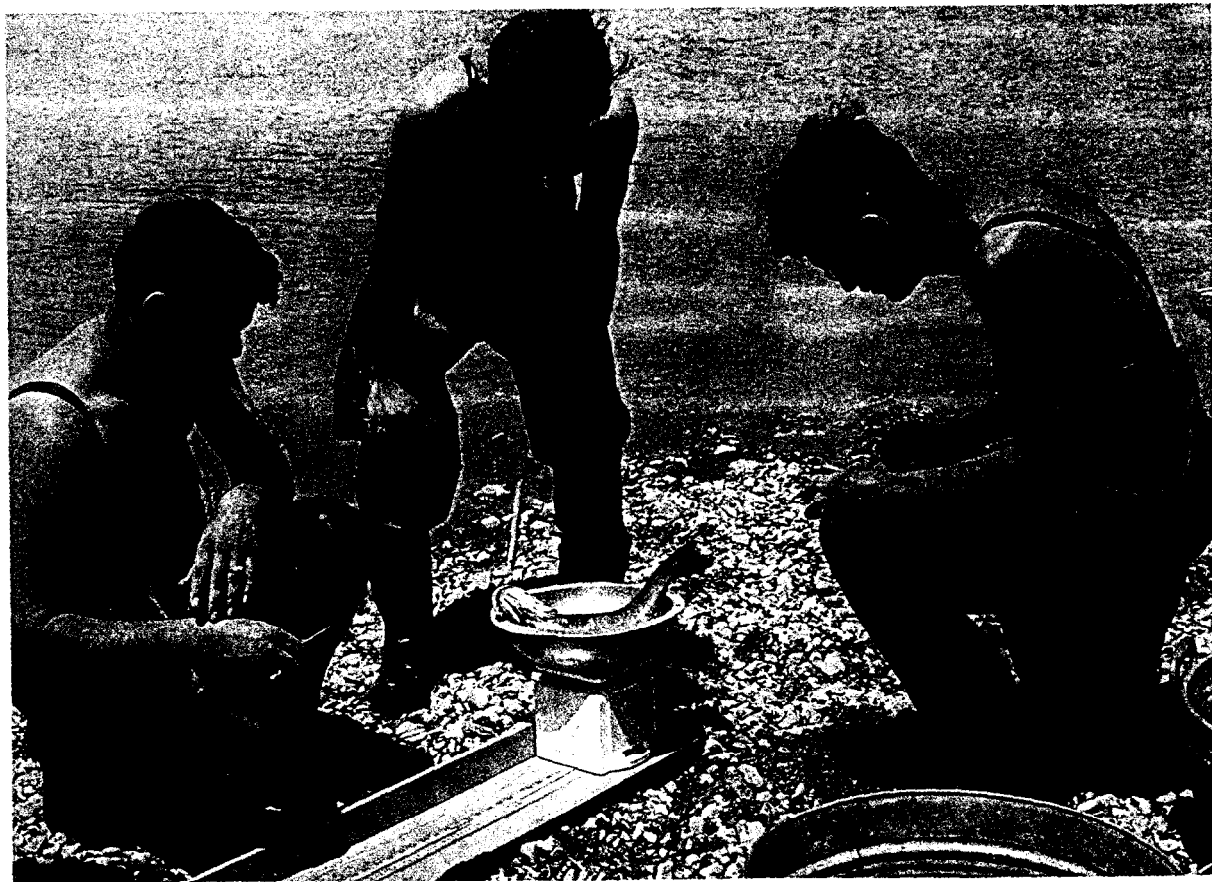
1955 when using a primitive diving lung for underwater pond study.

The farm pond program has continued to be popular and it is estimated that we have at least 320,000 of them today, many stocked with Department fish. In a peak year, the Department stocked over 6,000 ponds with fish. One major benefit of the pond program was that most were built in areas of the state deficient in water and where there had been little fishing opportunity before the farm pond program was adopted. Now they provide over a million recreational fishing trips each year.

With World War II over, Fisheries programs accelerated. A new kind of stream survey was begun in 1946, under John L. Funk. Designated stations were set up on

representative streams which were sampled spring, summer and fall each year to determine seasonal and annual variations in fish populations. This was continued for eight years and provided a good deal of valuable information on the diversity of stream fish, the magnitude of seasonal and annual variations, and the effects of floods, weather and other environmental factors. The information furnished was frequently used in setting regulations. This direct census, as it was called, was modified on Black River to accommodate comprehensive studies being made with University of Missouri personnel of pre- and post-impoundment conditions of Clearwater Reservoir (impounding Black River in 1948), which resulted in a landmark study of its type.

Funk also set up a general creel census;



Fisheries Biologist John L. Slim Funk, right, records data on fish captured using the electric seine in this 1940s era photograph, Fish were weighed, measured and a scale sample taken from which growth rate and age could be determined.



Fisheries crews sometimes set up shop by river banks to conduct research. This camp occurred along the Black River in Wayne County in July, 1948. Two years later the Dingell-Johnson Federal Aid to Fisheries Act provided funds to double the Fisheries Research staff

conservation agents collected data on fishing effort and catch information from anglers they checked in the course of their enforcement duties. This was continued for thirteen years and provided the first quantitative information on harvest of fish from all waters of the state. It showed that only a few anglers are likely to be successful, that a catch-rate of one fish in two hours was an average, and that most of the catch was composed of pan-fish on Ozark streams, bullheads and carp on prairie streams, and crappies and white bass on large reservoirs.

There were only two large impoundments

when the Commission took over in 1937—Lake of the Ozarks, impounding the Osage River in 1931, and Lake Taneycomo, impounding the White River in 1913. But these were soon followed by Lake Wappapello (1941) and Clear-water (1948).¹ The Commission decided research was needed on large reservoirs and Missouri was fortunate to hire Biologist Paul Eschmeyer in 1949, for assignment to this work. Eschmeyer was noted for developing new techniques for estimating fish populations. His study involved netting fish to determine composition and abundance, obtaining scale samples for age and growth analysis,

¹ Other large reservoirs in ensuing years were Norfolk (1944), Bull Shoals (1952), Montrose (1956), Table Rock (1959), Pomme de Terre (1961), Thomas Hill (1965), Stockton (1969), Harry S Truman (1979), Long Branch (1980), Smithville (1982), Mark Twain (1984), Longview (1985) and Blue Spring (under construction), for a total of 252,750 acres of water. Small impoundments, most privately owned and less than five acres in size, total 325,000, with 255,000 acres of water.



Creel censusing was an early attempt to keep tabs on fish and fishing. Census clerk Clarence Pumphrey, right, checks the catch of an angler on Lake Taneycomo in 1954, before Table Rock Dam changed the lake into trout habitat.

shoreline seining to measure success of reproduction and survival, electro-fishing and tagging to measure size and rate of exploitation of the bass population, and a quantitative creel census to measure harvest.

Wildlife management and research had been given a great boost with passage of the Pittman-Robertson Federal Aid to Wildlife Act in 1937. This was an excise tax on sporting arms and ammunition that was returned to the states through a complicated formula, to be used for research and land acquisition for wildlife. In 1950, a similar bill was signed—

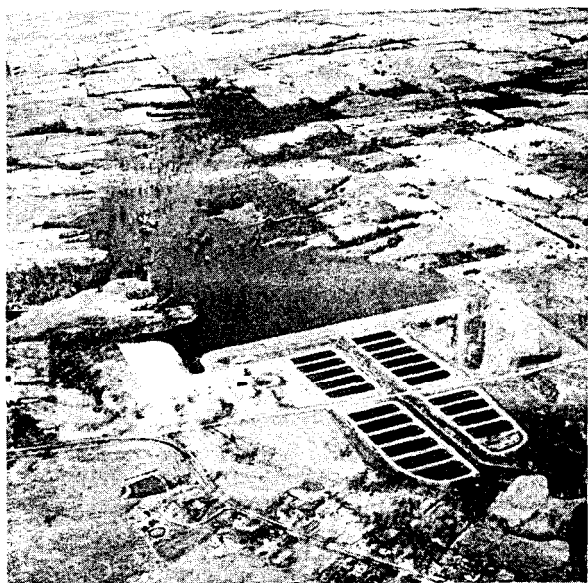
the Dingell-Johnson Federal Aid to Fisheries Act—which provided funds to states for fisheries work. These funds came from an excise tax on fishing tackle. Fisheries management and research were at last on an equal footing with wildlife. The research staff was doubled and more sophisticated equipment acquired.²

One of the problems with the farm pond studies was that they had to be conducted in cooperators ponds where the researcher lacked full control. With federal funds available, twenty-two half-acre ponds were built below Little Dixie Lake, along with a well-

*Biologists hired in anticipation of passage of the Dingell-Johnson Act included Charles A. Purkett Jr., who was to become chief of Fisheries and later an assistant director, and stream researcher George Fleener.



Charles Purkett was one of the fisheries biologists hired in anticipation of the Dingell-Johnson Act. In this 1963 photograph, he pursues fisheries research in the laboratory.



Twenty-two half-acre ponds were built below Little Dixie Lake to facilitate pond research studies.

equipped field laboratory for pond research. In 1963, to aid in stream research, Big Buffalo Creek Wildlife Research Area in Benton and Morgan counties was acquired. It contained 1.3 miles of Ozark-type stream that were increased to 2.2 miles by relocation into old channels. The acquisition permitted experimentation by Biologist Otto Fajen in methods of stream management which would have been impossible on private land. From his studies, Fajen developed concepts used today to advise private landowners on stream habitat management.

By 1967, the Fisheries Research Section consisted of a **superintendent**,³ twelve biologists, one chemist, six fisheries workers, some twenty part-time and seasonal workers, plus stenographic help. It was organized into three branches: streams, impoundments and water quality. Today, with the same three branches plus a data processing unit, there are **twenty-five** full-time professional people on the staff, but some new specialties have been added: biometry,⁴ aquatic entomology, genetics and computer sciences.

Fisheries research has come a long way. A great deal of information was amassed from those early surveys and the first fumbling attempts to learn more about the aquatic world and its denizens. A comprehensive study of fish taxonomy and distribution bore fruit with publication of Dr. William L. Pflieger's *The Fishes of Missouri* in 1975. Pflieger drew on the work of George Harry and the work of Biologist Perry Robinson as a basis for his study. It is the most comprehensive book on Missouri fishes for the layman ever published-but is equally valuable to the scientist.

We have learned a great deal about our streams and lakes and in recent years have refined regulations to perpetuate good fishing in the face of rising numbers of anglers using increasingly sophisticated equipment. In the days of the first fish and game chief, Arthur Clark, it was believed that any regulation made had to be applicable to every body of

³ Fisheries Research Section chiefs were Dr. W. C. Frohne (1939-1942), Aden C. Bauman (1942-1947), Paul G. Barnickol (1948-1959), John L. Funk (1959-1972), Joe G. Dillard (1972-1981), Dr. James R. Whitley since 1981.

⁴ Biometry is the science of statistics applied to biological observations.



*Dr. William L. Pflieger wrote the authoritative work, **Fishes of Missouri** in 1975. Pflieger won the prestigious American Motors Conservation Award for the book.*

water. We have since learned that each body of water is unique, though following well-known natural laws. It was once believed that no large impoundment could be fished out. We know better now, and have sophisticated regulations like slot limits to maintain good fish populations. Although never completely abandoned, in 1968 the Department began a return to minimum size limits to maintain the quality of fishing in streams and lakes. We have learned about opening day shock to fish populations in new lakes, and developed ways to offset this. A prime example of such shock is Little Dixie Lake, where the bass population was seriously reduced in just the first two days of fishing.

Fisheries Biologist Lee C. Redmond found that anglers removed forty to sixty-nine percent of the adult bass population in only the first four days of fishing in new lakes of twenty-two to 205 acres in size, at a fishing

pressure of only nine to thirty-eight trips per acre. He found that first-year harvest of bass at 240-acre Pony Express Lake reached seventy-four percent. Area Manager Jerry L. Turner, working with researchers Willis Hanson and Ralph Burr-is, found that at Little Dixie Lake anglers removed seventy-two percent of the bass. These high harvests created dramatic changes in the structure of the largemouth bass populations and within three years resulted in high populations of intermediate-sized bluegill, slow-growing bass and bluegill, and poor fishing success. A lower daily limit would have had to be two fish or fewer (down from ten) because most bass were removed at one or two per fisherman.

Missouri biologists led the nation in evaluating types of harvest regulations to prevent initial over-exploitation of bass in new lakes. These include a catch-and-release season prior to lake opening; leaving a lake open to fishing from time of original stocking; midwinter openings; refuge areas where fishing was not permitted; a forty percent harvest quota for bass; and length limits on bass.

Pond Research Biologist Kim Graham,



Fisheries Biologist Lee C. Redmond tackled the problem of opening day shock that occurs when opening day fishing seriously depletes a lake population.

working in Little Dixie research ponds, found the forty percent annual harvest rate on **large**-mouth bass to be about the allowable maximum to maintain balanced bass-bluegill populations over a four-year period. Biologists Lee Redmond, Eugene Zanella, Arvil Ming and Area Manager William C. **McDannold** found that the forty percent bass harvest quota in a ten-acre lake maintained a balanced fishing population that showed good growth of both bass and bluegills throughout four years, but the forty percent quota was rapidly reached in four or five days at a fishing pressure of only eighteen to forty-four trips per **acre**—not a very practical method to manage public fishing lakes.

The most promising technique found to manage largemouth bass populations in new lakes was a minimum size limit—not the small size of early years which protected fish until they could spawn, but a balanced **size**—one large enough to maintain predation of intermediate-sized sunfish but not so high as to allow excessive natural mortality before fish were available for harvest. To permit the new size limits to function properly, new lakes were stocked first with minnows, then a reduced number of small sunfish and a later addition of small bass. This resulted in fast bass growth, early bass reproduction and a broad size range of bass when the lake was opened to fishing two years later. A size limit of fourteen to fifteen inches on bass at opening allowed an immediate harvest of **one**-fourth to one-third of the original stock and resulted in excellent fishing for at least five years. High-quality catch-and-release fishing for bass smaller than the size limit was an added benefit. Imposition of a twelve-inch bass limit on most of Missouri's relatively small, older public fishing lakes in October, 1968, improved the structure of bass and bluegill populations and improved fishing for bass and bluegill for varying lengths of time. Later use of a protective size range regulation (slot length limit) on bass further improved fishing in some of these lakes.

Management techniques learned from studies on smaller lakes were successfully applied to 25,000-acre Stockton Lake in the late 1960s and early 1970s, to provide continuous good fishing rather than the peak and

decline cycle which previously characterized most reservoir fisheries. Use of minimum length limits on major predator fishes (black bass, twelve inches; walleye, eighteen inches; northern pike, tiger **muskies**, thirty inches) at newly developing Stockton Lake was a successful attempt to maintain high utilization, rapid turnover and high production of gizzard shad. Continuous good fishing resulted.

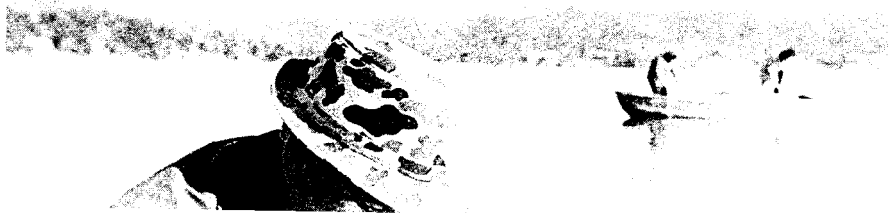
Using fish tags and a reward system, Biologist Arvil Ming found in the late 1960s that harvest of adult largemouth bass and spotted bass was a minimum of thirty-three to forty-two percent in large lakes such as Table Rock and Pomme de Terre. A **fifteen**-inch minimum size limit was established on Lake of the Ozarks, Pomme de Terre and Table Rock Lake in 1976. Bass fishing improved considerably, particularly at Lake of the Ozarks. National acclaim came to Missouri with newspaper headlines such as **Miracle in MO**, reflecting the dramatic comeback and quality of bass fishing in the Show-me State's major impoundments.

Based on early research at Table Rock Lake by Fred W. Vasey and Michael A. Colvin, biologists found very high annual exploitation rates on crappie, similar to the earlier findings in the black bass studies. Under a **thirty**-per-day creel limit restriction, anglers harvested forty-three percent of the nine inch and larger crappie at Pomme de Terre Lake and fifty-six percent at Stockton Lake in only a couple of months. Fishing pressure for crappie was only four or five trips per acre of water. Very few crappie four years or older remained at the end of the fishing season. In 1984, creel limits on most big lakes were reduced to fifteen crappie per day and in Stockton and Table Rock lakes a ten-inch minimum size limit was also applied. These measures, resulting from years of research, put Missouri at the forefront of fisheries management in the United States.

Water quality studies begun by Paul G. Barnickol and Herbert J. Fisher have become vastly more complicated with the addition of new chemicals into our environment by agriculture and industry. With increased urbanization and industrial development, water pollution has become an increasing problem. Milk processing plants, fertilizer factories, oil **re**-

fineries, chemical plants, lead mines and coal strip mines all produce oxygen-consuming or toxic effluents. The increased use of chemicals in agriculture and other applications has spread, sometimes leading to fish kills. Work of Department water quality specialists played a part in formation of Missouri's Clean Water Commission. In 1957, after a lot of hard work by the Conservation Federation, a water pollution law was passed that provided penalties for polluters. More recent Department studies of mussels, crayfish and other bottom-dwelling organisms have provided data for assessing effects of chlordane, lead and other pollutants-important knowledge in the continuing fight against degradation of our waters.

Studies of total recreational use of streams by Biologist George Fleener have been credited with saving the lower Platte River from channelization. His work opened our eyes to the importance of north Missouri streams to the state's overall recreation picture. Use of the corridors along streams for other types of recreation was found to be of importance at least equal to the fishery. Similar studies of the Grand, Gasconade, Bourbeuse, Big and Meramec rivers documented their values to the state's citizens for recreation. Studies of channelization revealed that approximately ninety percent of the fish were lost when a stream was channelized. Other studies, notably by John L. Funk and John W. Robinson,





Herbert J. Fisher was one of the early water quality biologists of the Department. The pollution he detected in the 1940s is still with us, as are a host of new chemical pollutants that affect our once-pristine waterways.

documented the loss of aquatic habitat along the Missouri River by channelization and stream straightening. As a result of such studies, the division is learning how best to manage streams. By protecting the riparian corridors many problems can be prevented or substantially reduced. Cooperative efforts between the Department and the Soil Conservation Service to help landowners with problems will greatly enhance these valuable Stream resources.

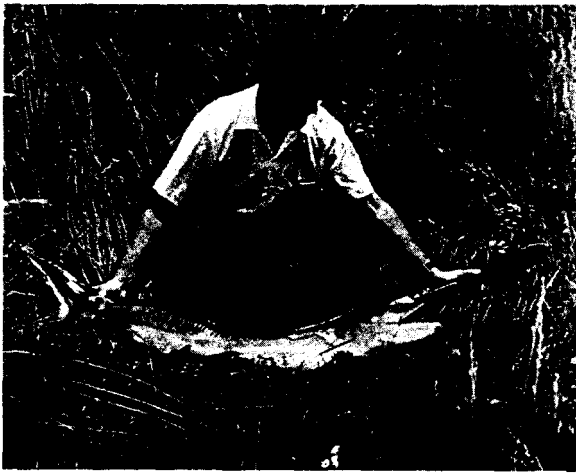
Reservoir research has shifted from the early emphasis on understanding the system to work on individual species. Crappie and bass studies resulted in the nation's first modern-day harvest restrictions on large reservoirs. Size and daily creel limits were imposed on crappie and size limits on black bass. In both instances it was the first time ever that

large reservoir fish populations and angler success were improved through management efforts. Missouri's work on harvest management studies has changed the course of fisheries management nationwide.

The new reservoirs presented problems that needed special attention. Construction of Truman Dam posed a problem to paddlefish which had depended on an annual spawning run up the Osage River from the time Lake of the Ozarks was impounded. The new dam would stop this, threatening Missouri's unusual paddlefish fishery. Between 1958 and 1961, Biologist Charles A. Purkett Jr. worked on the problem. Purkett was the first biologist to find the eggs and fry of the paddlefish and to discover their spawning requirements. Other biologists—Robert Needham, Tom Russell and Kim Graham—worked out their life history. Biologist Tom Russell and Hatchery Manager Jerry Hamilton developed methods to hatch and rear paddlefish; the Lake Ozarks and Truman Lake fisheries are maintained with hatchery-reared fish. They have also been successfully introduced into Table Rock Lake and are providing recreational fishing there.



Biologist George Fleener weaves a fishing net web in 1965. Fisheries biologists today use a mix of new and old technologies to accomplish their goals.



Purkett and paddlefish in 1968—the research conducted on paddlefish made it possible to maintain a fishery despite adverse effects of Truman Dam.

Analysis nowadays has shifted from species to strains within species. Where it was once thought a walleye was a walleye, it was learned that there are different strains. Using a technique known as electrophoresis, which analyzes fish enzymes and proteins, it may be possible to select appropriate strains of faster growing, larger-sized fish for stocking. At the same time, it is possible to identify and preserve native strains of fish.

Hatchery work, too, has seen some remarkable changes over the past fifty years. In 1937, there were seven fish hatcheries in operation: Bennett Springs, Roaring River, Montauk, Lewis and Clark, Chesapeake, Branson and Sequiota, plus rearing ponds in Forest Park, Gibbs Lake, Glaize and Higginsville. Today there are ten hatcheries, five for warm water species, five for cold water species, plus rearing pools at Lake Paho.

Most hatchery workers in 1937 were politically appointed and none had any professional training, though they were good at their jobs. Guy Berry for example, who managed the hatchery at Sequiota and later Shepherd of the Hills Hatchery, was one of the best trout handlers in the country, despite the fact he could neither read nor write.

When the first biologists came aboard



Hatchery Superintendent Guy Berry worked for both the old Fish and Game Department and the new Commission. He retired as superintendent of the Shepherd of the Hills Hatchery in 1969 after thirty-six years rearing trout.

they were viewed with suspicion. The hatchery men believed the Fisheries Section was their domain and that the biologists were upstarts bent on changing their ways. When a professional biologist was sent to one hatchery to learn the ropes, the manager made life so miserable for him that he had to return to the research office. The manager believed the biologist was trying to get his job. And, at first, the biologists did not appreciate the qualities of the hatcherymen. Some biologists felt their job was to prove that some of the old practices were bad and they should find ways to do things more efficiently and economically. This didn't endear them to the hatcherymen, either. Fortunately, Superintendent of Hatcheries George Morris was an exception, and brought harmony between the parties.⁵

The Commission put a stop to indiscri-

⁵ Hatchery Section superintendents have been A. G. Morris (1937-1968) and Charles E. Hicks (1969-1986).



Albert George Morris served as hatchery superintendent from 1937 to 1969. He also served four years under the old Fish and Game Department.

minate stocking of private waters for political cronies almost immediately. They established a policy of providing fish only to public waters. In 1941, this was modified to provide fish free of charge to private pond owners if ponds met certain specifications and a degree of public access was permitted.

According to John Funk, there were doubts about the place of fish hatcheries when the Conservation Commission came into being. This was partly due to the observation that dumping fish indiscriminately into waters seemed to have no notable benefits. Questionable practices of some hatcherymen often resulted in stocking fish with little chance of survival-fry or eyed eggs, or sick and dis-

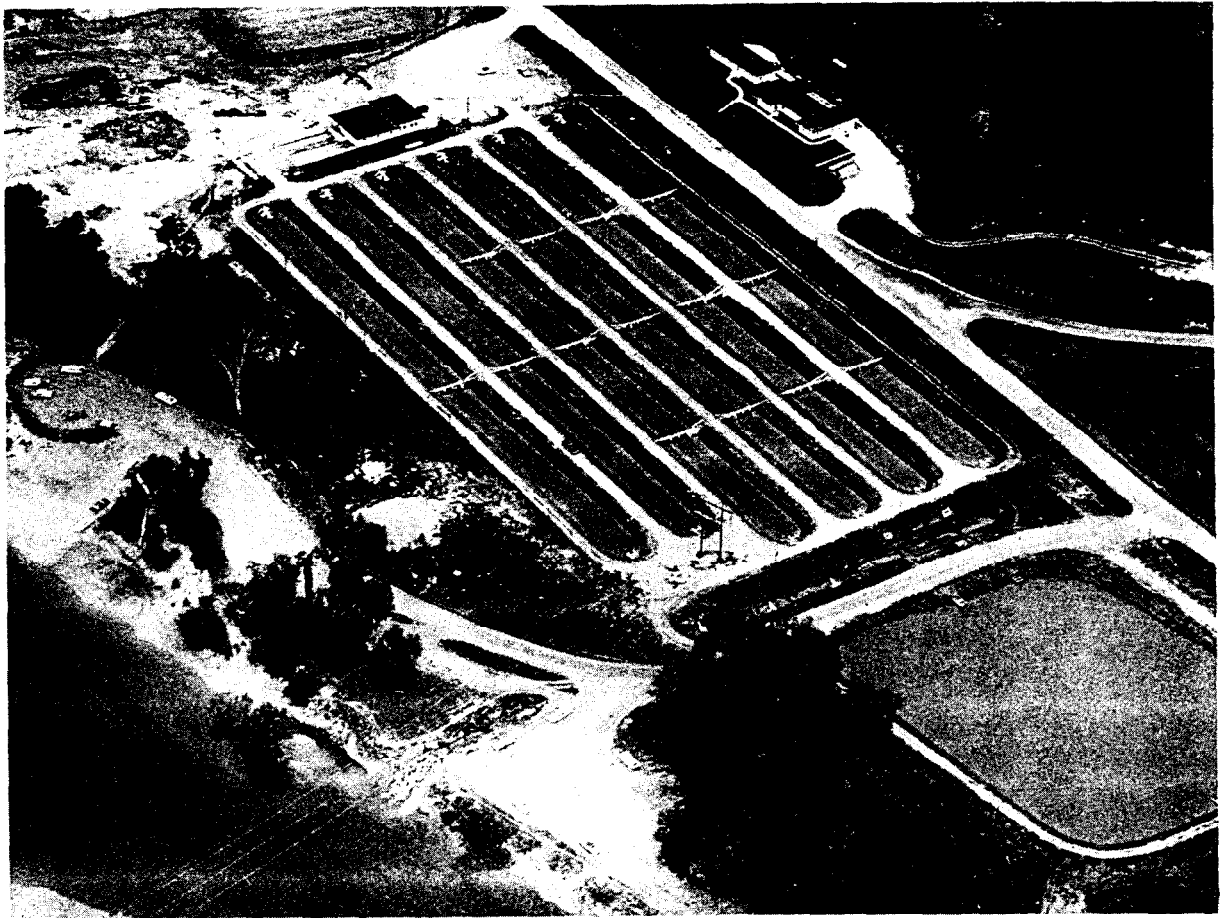
eased fish. If game fish were not available, forage species might be stocked, but the reports were expanded anyway and paper fish was an inside joke. Nevertheless, the expansion of hatchery facilities by work of the WPA and CCC was needed when the new farm pond program created a heavy demand for fish. Fish continued to be stocked in streams as maintenance stockings into the 1940s, when studies showed that natural reproduction was adequate to maintain populations and the practice was halted.

Trout programs at the three state parks were another factor that kept hatcheries in operation. Put-and-take trout fishing has grown rapidly at the parks,⁶ necessitating drastic changes in hatchery operations to keep up. One change was selective breeding of spring-spawning trout to fall spawners. This enabled hatcheries to hatch and rear the fry inside during the winter and move them to outside raceways vacated by the last year's crop being stocked in the streams.

Another efficiency was the development of pellet trout food by Hatchery Supervisor A. G. Morris, working with a nutritionist from Ralston Purina Company. Previously, trout were fed a ration of liver and waste meat products mixed with cereal. It took a great deal of time and skill on the part of the hatcherymen to grind and mix the food. By 1958, Missouri trout hatcheries converted to the dry pellet food at a great savings in time and labor. The pellets floated and trained the trout to feed at the surface. Most important, the ratio of amount of food required to produce a pound of trout was reduced, resulting in increased efficiency and reduced costs.

When Table Rock Reservoir was impounded in 1959, its low-level outlet poured cold water into Lake Taneycomo, which became too cold to support good populations of any fish except trout. This was foreseen by Fisheries personnel, who made arrangements with federal hatcheries to provide trout for annual stockings. Arrangements for a water supply were also made with the Corps of Engineers and Shepherd of the Hills Hatchery was constructed by the Department below Table Rock Dam. It went into operation the

⁶ Maramec Spring Park was added to the intensive trout management areas in 1958.



In this 1961 aerial view, Shepherd of the Hills Hatchery appears much as it did upon opening in 1958. Later construction efforts transformed it into the state's largest hatchery and one of the largest coldwater hatcheries in the nation. The facility produces over 400,000 pounds of trout a year.

year before impoundment. A modern facility, it provided trout not only for Lake Taneycomo but also for other trout fisheries around the state. It has a visitor center that hosts many thousands of visitors each year.

Taneycomo became our first trout lake, and further research led to introducing amphipods and isopods (freshwater shrimp) into the lake as a natural trout food that helped produce especially desirable fish.

Daily fees were initiated at the trout parks in 1938, which defrayed most costs of the put-and-take fishing operations, but at Lake Taneycomo charging daily fees was not possible. To offset costs an annual trout license was initiated in 1962, later to become a trout stamp. Funds from this have helped

defray costs of trout fisheries throughout the state. Focus of trout operations goes beyond the parks to trout management areas on springfed streams, some featuring trophy fishing-sometimes catch-and-release. Trout hatcheries now also rear brown trout for some of the areas.

Warm water hatcheries have changed operations drastically as well. Where once their main production was destined for the burgeoning farm pond program and Department-built lakes, now they have shifted emphasis to raising fish such as **muskies**, striped bass, walleye, paddlefish, channel catfish and some hybrid species for stocking into public waters. Missouri hatcherymen pioneered in the hatching and rearing of channel catfish



Even in 1944, Roaring River State Park attracted a crowd of anglers on opening day. Roaring River first opened to trout fishing in 1932.

which go into public waters.

Warm water hatcheries still operate substantially under the policy formulated in 1948: hatchery-reared fish are available to establish populations in new waters, to replace fish where they have been exterminated by unnatural causes such as pollution, to assist in correcting an unfavorable balance between predator and prey species, to introduce new species into existing water, and to provide channel catfish for the popular put, grow and take state lakes fisheries.

Where once it was thought that hatcheries would eventually be abandoned, it is now recognized that they remain an important part of the fisheries management picture. They are no longer seat-of-the-pants operations, but run by professionally-trained personnel, with special expertise in nutrition and pathology. As a result, they produce many more and healthier fish than the old timers

could even have imagined. The services and know-how of these professional fish culturists are made available to private hatcheries and landowners as well.

Comparing modern hatchery operations with those of days gone by reveals a stark contrast. The days of gathering and weighing fish by hand, putting them into milk cans and transporting them in the back of a truck or via the old railroad fish car, Benton, are long gone. Ultra-modern equipment is now used to process, count, weigh and move fish to aerated vehicles for transport. There still remain many hand operations, in cold, disagreeable conditions, but no one would willingly go back to the good old days.

Along with the growth in fisheries research and hatcheries there arose a need to provide management of fish populations on private waters. The first contact usually was the conservation agent. If it was a minor



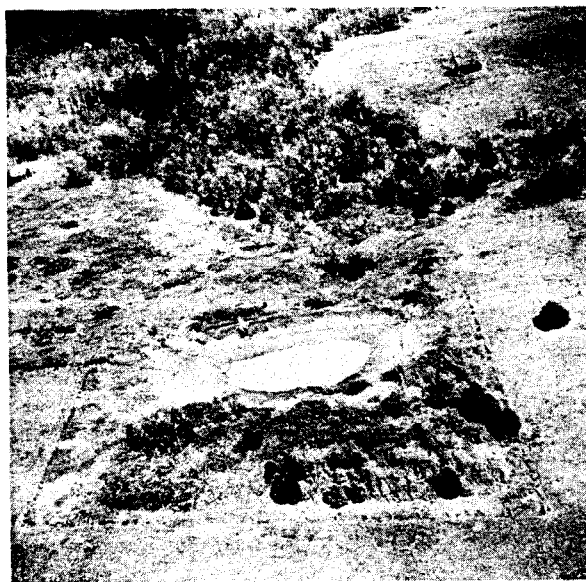
The introduction of muskellunge to Missouri waters was another Fisheries success story. Muskies like the one held here by Larry Belusz have added size and variety to sport fishing in the state.

problem he might handle it or the Field Service agent might be called in. But it soon became apparent that this was an area that needed the knowledge and assistance of trained fisheries people on a continuing basis.

Department-built lakes began to have problems, too, from weed problems to over-fishing. The August A. Busch Memorial Wildlife Area near Weldon Spring, opened to fishing in 1950, was the first major fishing installation. It featured many small lakes that were heavily fished-100,000 fishing trips per year. They needed constant attention, and as the Community Lake Program got into high gear after 1958, those lakes also needed attention.

The first full-time management specialist rose from the ranks of conservation agents. Gilbert F. Weiss spent weekends and evenings

(often the only time a pond owner could get together with him) figuring out the problem and recommending solutions. Eventually, more management personnel were added—John Goddard and Jack Hoey were among the first management biologists—districts were carved out, and a management section created. Its job was, and is, to apply the information research has gathered to private and Department waters. There are presently seventeen management districts and forty-five management biologists and specialists scattered over the state. Passage of the Wallop-Breaux amendment in 1985, which tripled funding under the federal aid to fisheries Dingell-Johnson Act, has made possible increases in fisheries management personnel.



This Callaway County farm pond demonstrates recommended planting and fencing patterns for attracting wildlife. Cattle are watered at the tank beneath the dam.

Additional management staffing will permit annual sampling of fish populations in nearly all public impoundments, resulting in better, more intensive management and improved fishing in some 300 lakes. Owners and users of private lakes will benefit from the expansion by sampling of about 500 private lakes each year to advise owners on better

⁷ Fisheries Management Section chiefs have been C. A. Purkett Jr. (1962-1964), J. P. Fry (1964-1967), Lee C. Redmond since 1967.

management. In addition, private pond management duties previously handled by Wildlife Division's field service staff were transferred to Fisheries Management Section in 1986. This will result in about one thousand additional private ponds per year receiving better management.

An innovative and comprehensive approach is under way with some of the new funding to solve a vexing problem-the steady decline in fish habitat quality in streams. By the 1980s, channelization, floodplain development and inappropriate land use had resulted in destruction of riparian forests, eroding streambanks, stream channels choked with excessive amounts of sand, silt or gravel, and altered fish population structures.

In 1986, statewide efforts were begun in each fisheries management district, utilizing the services of two stream management biologists and their staffs, plus support from stream research biologists, to bring a fresh and unique approach to stream management. This multi-pronged approach involves a public awareness

campaign, stream management demonstration areas, technical assistance to landowners and other agencies, coordination with other agencies to ensure that stream and big river efforts complement one another, and continued analysis and research of stream ecosystems and their use. This program is directed toward combating abusive stream practices and to provide suitable alternatives, as well as to bring stream fisheries into scientific management.

This area of fisheries work will play an important role in the enhancement and maintenance of fishing opportunities of the future.

The Department's public lakes program began in 1950, when August A. Busch Memorial Wildlife Area opened to fishing, followed by Lake Paho in 1951. Between 1950 and 1976, the Department acquired thirty-six lake areas in thirty-two counties. The Community Lake Program began in 1958, with Jamesport Community Lake in Daviess County. Under this program, the Department would build and maintain a lake if the local com-



Fishermen enjoy an afternoon's recreation at Lake Paho-the first lake to be built as part of the Department's public fishing lake program. It opened in 1951.

munity purchased the land. Nineteen lakes were constructed under this program. Following passage of the conservation sales tax in 1976, the Department changed the policy, waiving the requirement that the community purchase the land for public fishing lakes.

Since 1977, the Department has purchased five existing lakes and eleven lake sites, which together will total 980 acres of fishing waters when all are developed. In 1980, the Commission approved creation of a Community Assistance Program which permits the Department to enter into agreements with municipalities or other agencies to make their lakes available for public fishing. The Department's role is to develop public use facilities—roads, parking lots, boat ramps, privies—and to manage the lake through stocking, regulation and enforcement. At this time, there are fifteen lake areas under this program, with 1,950 acres of water providing close-to-home fishing.

In 1958, St. Louis sportsman Ross E. Stones donated some land on Big Piney River for the Department to develop as a free public fishing access. This was the beginning of a program that grew to embrace not only stream access, but streamside recreation in all its aspects. The three types of properties acquired by the Department include canoe and boat launching areas, frontage areas usually on small streams, and larger multiple-use areas on streams or rivers. Between 1958 and 1977, the Department had acquired 109 sites on floatable streams. Since passage of the conservation sales tax it has added 111 stream areas in seventy counties through purchase, lease or donation. Of this total, fifty-four are small canoe or boat launching sites, forty-seven are stream frontage areas and ten are multiple-use areas. The aim is to have some public access at least every ten miles along major recreation streams.

Fisheries was only a small section within the Fish, Game and Forestry Division in 1937, with only fourteen employees including the chief, Dr. G. B. Herndon. It grew slowly until



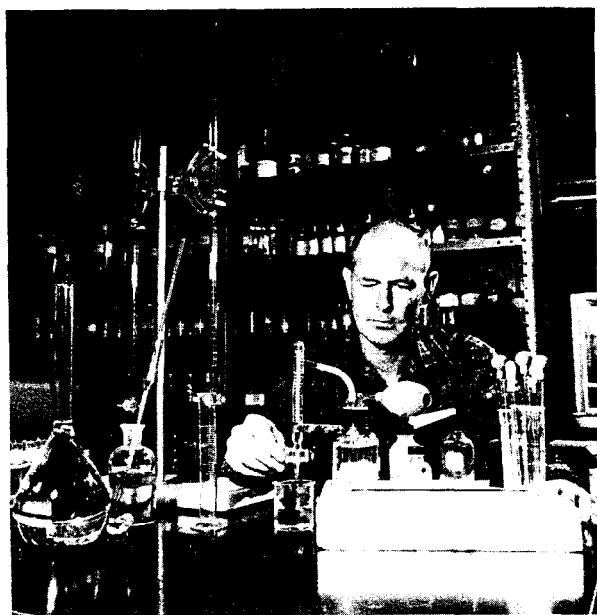
There's nothing like a stringer of fish to light up the eyes of a child. Kids Fishing Day, now an annual event, introduces youngsters to the fun of fishing.

passage of the Dingell-Johnson Federal Aid to Fisheries Act of 1951. In the reorganization of 1964, it became a separate Division of Fisheries organized into four sections: hatcheries, research, management and special use areas. The latter manages public areas where fishing is a prominent feature.⁹

As an indication of the growth of fisheries knowledge and complexities since the days of dumping California salmon into the Missouri River, there now are 197 people in Fisheries Division including clerical support, with specialties the founding fathers never dreamed of. Besides fish culture aids and fisheries specialists, there are computer scientists, biometricians, an aquatic entomologist, naturalists and fish pathologists—all endeavoring to manage aquatic wildlife resources in Missouri.

⁸ Fisheries Division chiefs have been Dr. G. B. Herndon (1937-1959), P. G. Barnickol (1959-1964), Charles A. Purkett Jr. (1964-1978) and James P. Fry since 1978. Assistant Division chiefs were P. G. Barnickol, C. A. Purkett Jr., J. P. Fry and since 1979, Stanley M. Michaelson.

⁹ Special Areas Section chiefs have been A. Reed Twichell (1952-1965), M. LeRoy Heman since 1965.



Dr. James R. Whitley, superintendent of Fisheries Research, is credited with making the Department's water quality unit one of the finest in the country.

Advances are not as obvious as the comeback of deer and wild turkey, but are just as spectacular in a quiet way. Where once there was essentially no bass fishing in north Missouri, now it is common. There now are muskellunge, tiger-mu&es, striped bass and striped-white bass hybrids in Missouri waters. Hundreds of thousands of farm ponds dot the Missouri landscape, most offering good fishing near at hand. The quality of stream fishing has been brought back from the drought days of the 1930s, and streams support good fishing despite increased pressure. Missouri cities now have urban fishing programs, leading the nation in this activity. The thousands of acres of new fishing water created by flood control and power reservoirs are being carefully managed to maintain fishing as good as any in the nation.

Problems still exist, especially maintain-



Pollution, the ever-present threat to fisheries, looms on the horizon as a challenge to Fisheries personnel. Here, Frank Ryck holds a fish killed by pentachlorophenol which leaked into the Big Piney River from a nearby wood treating plant in December, 1973.

ing water quality in the face of modern society's dependence on chemicals harmful to fish. Missouri badly needs an overall water policy to protect its waters. Until it adopts such a policy the Fisheries Division, with help from the Department of Natural Resources, remains on the front line against further degradation of Missouri waters.